TECHNOLOGY NEEDS/OPPORTUNITIES STATEMENT

IMPROVED MULTI-CANISTER OVERPACK (MCO)
GAS SAMPLING SYSTEM

Identification No.: RL-SNF09
Date: November 2000

Program: Spent Nuclear Fuel (SNF)
OPS Office/Site: Richland Operations Office/Hanford Site
PBS No.: RL-RS03
Waste Stream: SNF-02, Dry K Basins Fuel, Multi-Canister Overpacks (MCOs)
TSD Title: N/A
Operable Unit (if applicable): N/A
Waste Management Unit (if applicable): N/A
Facility: Canister Storage Building (CSB)

Priority Rating:

This entry addresses the "Accelerated Cleanup: Paths to Closure (ACPC)" Priority:

____ 1. Critical to the success of the ACPC
____ 2. Provides substantial benefit to ACPC projects (e.g., moderate to high lifecycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays)
_X__ 3. Provides opportunities for significant, but lower cost savings or risk reduction, and may reduce uncertainty in ACPC project success.

Need Title: Improved Multi-Canister Overpack Gas Sampling System.

Need/Opportunity Category: *Technology Need* -- There is no existing or currently identified technology capable of solving the site's problem (i.e., technology gap exists, no baseline approach has been identified).

Need Description: The Tri Party Agreement schedule requires the removal of spent nuclear fuel from the K Basins and its dry storage at the Canister Storage Building (CSB). The CSB will receive, stage, and store approximately 400 Multi-canister overpacks (MCO), each of which will contain five or more metric tons of vacuum dried, metal-form Spent Nuclear Fuel (SNF) under an eleven psig (nominal) helium cover. The project baseline seals the fuel in welded MCOs for interim storage. Once MCOs have been placed into storage at the CSB there is no safety requirement, regulatory requirement or precedent to monitor them. Although not required, acquiring data at a reasonable cost that may be useful in developing a fuller understanding of the behavior of an engineered system is good engineering practice. Therefore, a limited program is

needed to observe pressure/temperature/gas composition relationships in a small number of MCOs during the first two years in storage.
A sampling cart has been built to monitor some of the MCOs during the first year of storage to verify performance. The unit weighs approximately 1 ton. The current technology could be improved, for example, by utilizing a more compact unit that is capable of taking smaller samples in a manner that prevents a major flush and refill of the MCO gas. Therefore, it is desirable to identify an alternative to the planned baseline technology/process.

Schedule Requirements:
Earliest Date Required: (03/2001)
Latest Date Required: (06/2001)

Monitoring must be completed in time to weld the MCO closure and store the monitored MCO prior to SNF Project completion.

Problem Description: The MCO monitoring activity objective is to obtain data on the actual behavior of stored MCOs. The MCO must be removed from the storage tube and moved to the weld station to be sampled. The MCO can have significant amounts of hydrogen gas in the sample as well as fission gases of Xenon. The hydrogen to xenon ratio is an important parameter as well as the helium to hydrogen ratio. The current SAR does not allow a vacuum to be pulled in the MCO port valve in CSB, which complicates the sampling process by conventional means. Also, a minimum of 30.27 gmoles of helium must be maintained in an MCO. Once sampling has occurred, it is difficult to determine the amount of remaining helium in an MCO since the temperature of the MCO cannot be controlled accurately. Technology to sample the MCO does exist if a vacuum can be pulled on the MCO port valve.

Potential Life-Cycle Cost Savings of Need (in $000s) and Cost Savings Explanation: Cost savings are associated with sampling six MCOs on a quarterly basis for two years. Approximate cost is $20K per year. Obtaining a sample from an MCO is currently very time consuming, and involves opening an MCO valve that has a limited number of cycles before the seal must be changed. Cost savings are realized from eliminating the refilling of an MCO with inert gas. Improved technology could reduce cost by 50 % for a savings of $40,000 over the projected four years sampling will be conducted.

Benefit to the Project Baseline of Filling Need: The biggest risk in the current approach is losing the helium pressure on a MCO in the CSB, which is a Technical Safety Requirement Violation. The second problem is the current system draws too large of a volume of helium and is much larger than required to obtain a laboratory scale sample and requires fresh helium to be introduced into the MCO. The new system would eliminate the need for refilling with helium and pull a small laboratory scale sample.

Relevant PBS Milestone: S00-01-909 - Complete Spent Nuclear Fuel Project

Functional Performance Requirements: The MCO monitoring activity will permit acquisition of temperature, pressure, and gas composition data from a small number of MCOs over a limited period

of time using non-intrusive, cost-effective data acquisition methods. The proposed approach would monitor 4 to 6 MCOS for up to two years. The designated MCOs would be staged and configured to permit monitoring, via engineered connections to ports in the mechanical closure head. Temperature and pressure will be recorded frequently. The pressure range of interest is 0 to 50 psig, with 2% accuracy. The temperature range of interest is 0 to 120°C, with accuracy within 2°C.

Gas sampling is proposed no more frequently than quarterly, with removal of a sample through a simple connection to the MCO.

Work Breakdown Structure (WBS) No.:	***TIP No.:***
TBD	N/A

Justification For Need:

Technical: Previous investigations have been limited to small fuel samples or simulant prototypes and have been relatively short in duration. MCO monitoring can provide data on large loads of actual fuel, in full-scale configuration, over longer time periods. Additional knowledge of this fuel type may prove valuable in future analyses or applications.

Regulatory: N/A

Environmental Safety & Health: N/A

Cultural/Stakeholder Concerns: Monitoring is of interest to the DNFSB.

Other: None identified.

Current Baseline Technology: The gas sampling activities will be performed within the CSB's "Sampling/Weld Area. A Sampling Cart will be used during all MCO sampling operations and is designed to provide a mobile storage location for the components required to: 1) determine MCO internal pressure, 2) sample the MCO internal atmosphere (for lab analysis), and 3) refill the MCO with inert gas following the sampling operations to ensure a positive pressure (nominally at 9.0 - 30.0 psig) during MCO storage.

End-User: Canister Storage Building.

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